

**Warm-up** Solve the following equations then check your answers:

a)  $5x + 2 = 2x + 11$

$-2 \quad -2$

$5x = 2x + 9$

$-2x \quad -2x$

$\frac{3x}{3} = \frac{9}{3} \quad x=3 \checkmark$

Check  
 $5(3) + 2 = 2(3) + 11$   
 $15 + 2 = 6 + 11$   
 $17 = 17$   
Woo!

b)  $\frac{6}{5}x - 3 = -5$

$\frac{6}{5} \cdot \frac{5}{5} x = -2 \cdot \frac{5}{5}$

$x = \frac{-10}{6}$

$x = -\frac{5}{3}$   
 d)  $\frac{3x}{2} = \frac{5x}{6} + 1$

$\frac{6}{5} \left(\frac{5}{5}\right) - 3 = -5$   
 $-2 - 3 = -5$   
 $\checkmark -5 = -5$

c)  $\frac{2}{5x} = -4 \cdot 5x$

check:

$\frac{2}{5(-\frac{1}{10})} = \frac{2}{-\frac{5}{10}}$

$2 \div \frac{-5}{10} = 2 \cdot \frac{-10}{5}$   
 $= \frac{-20}{5} = -4 \checkmark$

$2 = -20x$   
 $\frac{-20}{-20} \quad \frac{-20x}{-20}$

$x = -\frac{2}{20} = -\frac{1}{10}$

$\frac{3x}{2} \cdot \frac{6}{6} = 5x + 6$   
 $9x = 5x + 6$

$4x = 6$   
 $x = \frac{6}{4} = \frac{3}{2}$

$\frac{3 \cdot 3x}{2} = \frac{5x}{6} + \frac{1 \cdot 6}{1 \cdot 6}$   
 $\left(\frac{9x}{6} = \frac{5x}{6} + \frac{6}{6}\right) \cdot 6$   
 $9x = 5x + 6$   
 $4x = 6 \Rightarrow x = \frac{3}{2}$

**Word Problem Vocabulary**

When we solve word problems, the most important (and difficult) step is to turn the word problem into an equation. Below are common phrases and what they look like as equations.

The sum of a number and 4  $x + 4$

Six more than a number  $x + 6$

Two added to a number  $2 + x$

A number increased by ten  $x + 10$

Eight times a number  $8x$

Fifteen percent of a number  $\frac{15}{100}x @ 0.15x$

Double a number  $2x$

The product of a number and four  $4x$

Seven less than a number  $x - 7$

Nine minus a number  $9 - x$

A number decreased by 5  $x - 5$

Half a number  $\frac{1}{2}x @ \frac{x}{2}$

The quotient of a number and six  $\frac{x}{6}$

The quotient of five and a number  $\frac{5}{x}$

Tips for solving word problems

1. Highlight the parts of the question with important information (like the phrases on the last page)  $x = \text{what?}$
2. Define a variable (something you don't know but you want to solve for)
3. Setup an equation you can solve, then solve it
4. Relate your answer for  $x$  back to what the question is asking for. Check it if you can!

**Ex 1** The sum of 3 consecutive odd numbers is 51. Find the numbers.

$x = \text{middle num}$   
 before =  $x - 2$   
 after =  $x + 2$

$$\Rightarrow 51 = x + x - 2 + x + 2$$

$$51 = 3x$$

$$x = \frac{51}{3} = 17$$

Ans:  $\begin{matrix} 1^{\text{st}} & \text{mid} & 3^{\text{rd}} \\ 15 & + & 17 & + & 19 & = & 51 \end{matrix}$

**Ex 2** A father has a son that is one-third his age plus 2. If you subtract their ages, you get 28. How old is each person?

$x = \text{father}$   
 Son =  $\frac{x}{3} + 2$

$$\Rightarrow 28 = x - \left(\frac{x}{3} + 2\right)$$

$$28 = x - \frac{x}{3} - 2$$

$$30 = x - \frac{x}{3}$$

$$90 = 3x - x$$

$$90 = 2x$$

$$x = 45$$

Ans:  $\begin{matrix} \text{Dad} & \text{Son} \\ 45 & 17 \end{matrix}$

$\frac{45}{3} + 2 = 15 + 2$

**Ex 3** A 87 cm piece of wood is cut into 3 pieces. The second piece is 60% of the length of the first piece. The third piece is twice the length of the first piece minus 3. What is the length of each piece?

$x = 1^{\text{st}} \text{ piece}$   
 $2^{\text{nd}} = 0.6x$   
 $3^{\text{rd}} = 2x - 3$

$$87 = 1x + 0.6x + 2x - 3$$

$$90 = 3.6x$$

$$\frac{90}{3.6} = x$$

$$25 = x$$

Ans:  $\begin{matrix} 1^{\text{st}} & 2^{\text{nd}} & 3^{\text{rd}} \\ 25 & + & 15 & + & 47 & = & 87 \end{matrix}$

$0.6 \cdot 25$        $2 \cdot 25 - 3$